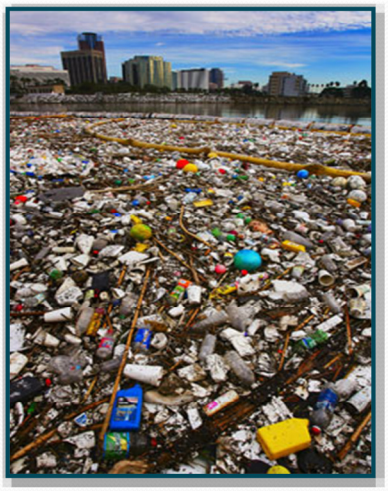
Impacts of Trash on the Aquatic Environment

Anna-Marie Cook
Marine Debris Program Coordinator
EPA Region 9

Every 15 seconds this amount of plastic garbage gets released into the sea

Up to 80% of marine debris originates from land-based trash. Pollution entering waterways in most cities spikes after storm events

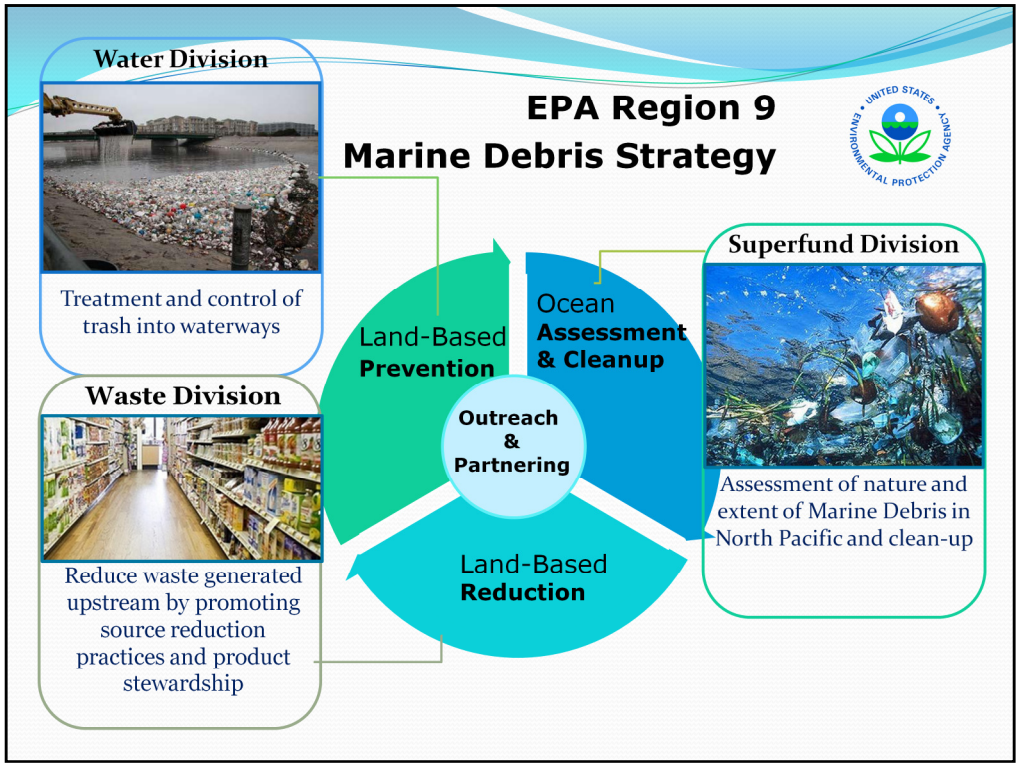


Los Angeles River

Photo: Rick Loomis, LA Times

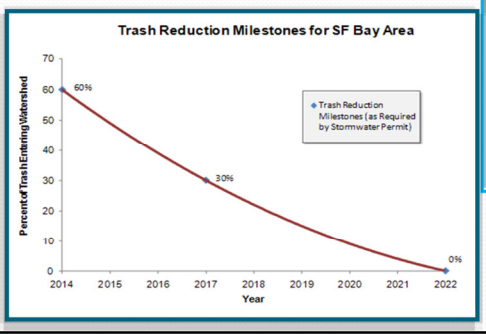
San Jose's Coyote Creek

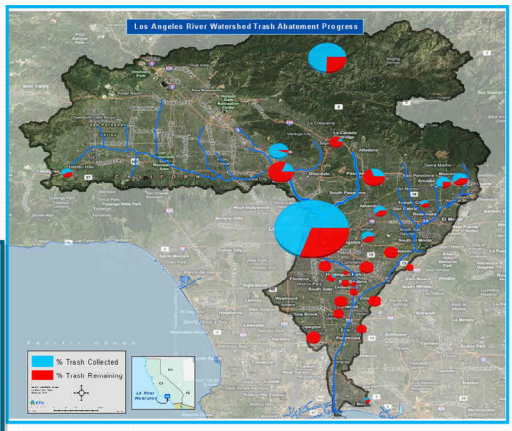
Photo Credits Santa Clara Valley Water District


EPA Region 9
Marine Debris Strategy
Water Division
Treatment and control of trash into waterways
Waste Division
Reduce waste generated upstream by promoting source reduction practices and product stewardship
Land-Based Prevention
Ocean Assessment & Cleanup
Outreach & Partnering
Land-Based Reduction
Superfund Division
Assessment of nature and extent of Marine Debris in North Pacific and clean-up

Tracking MS4 permit requirements

Trash capture device

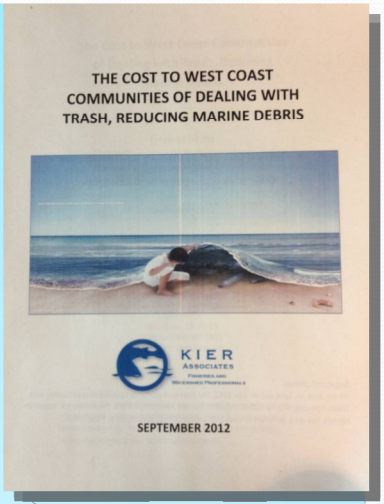




Los Angeles River Watershed Trash Abatement Progress

Cost to Local Governments of Managing Trash

- EPA R9 completed a study of 90 Coastal cities in CA, OR and WA in 2012.
- Study found that cost to West Coast cities to manage trash is over $500 Million/year
- HDOH and University of Hawaii have requested as similar study for City and County of Honolulu in FY 2014.



7 of the top 10 items collected during the 2011 ICC Day:

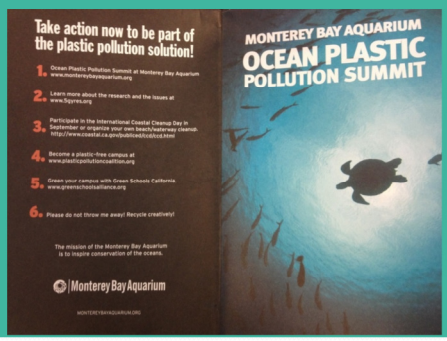
1) Cigarette Filters
2) Caps/Lids
3) Plastic Beverage Bottles
4) Plastic Bags
5) Food Wrappers/Containers
6) Cups, Plates, Forks, Knives and Spoons
7) Straws/Stirrers

•Last year 280 million tons of plastic was produced globally. Less than half made it to the landfill or was recycled. The remaining 150 million tons is either still in use or littering the land and oceans.

•The US throws away $11.5 billion worth of recyclables every year.

Source Reduction Grants

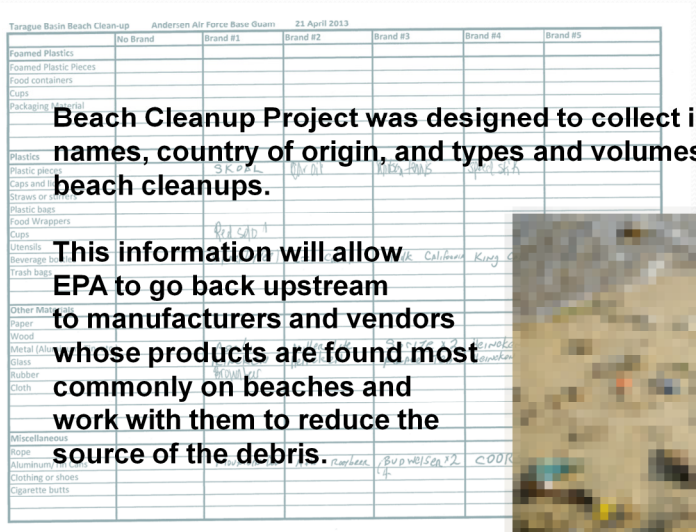
- Monterey Bay Aquarium
- Product Stewardship Institute
- Coyote Creek Trash Reduction Project – City of San Jose
- Packaging Waste Source Reduction Pilot – Clean Water Fund



CLEAN WATER FUND

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Beach cleanup work to support source reduction

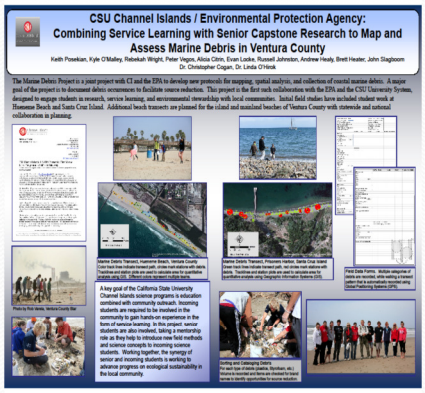

Tarague Basin Beach Clean-up Andersen Air Force Base Guam 21 April 2013

	No Brand	Brand #1	Brand #2	Brand #3	Brand #4	Brand #5
Foamed Plastics						
Foamed Plastic Pieces						
Food containers						
Cups						
Packaging Material						
Plastics						
Plastic pieces						
Caps and Lids						
Straws or stirrers						
Plastic bags						
Food Wrappers						
Cups						
Utensils						
Beverage bottles						
Trash bags						
Other Materials						
Paper						
Wood						
Metal (Aluminum)						
Glass						
Rubber						
Cloth						
Miscellaneous						
Rope						
Aluminum/Tin Cans						
Clothing or shoes						
Cigarette butts						

Beach Cleanup Project was designed to collect information on brand names, country of origin, and types and volumes of debris found from beach cleanups.

This information will allow EPA to go back upstream to manufacturers and vendors whose products are found most commonly on beaches and work with them to reduce the source of the debris.

EPA R9 has signed beach cleanup partnership agreements with Navy SouthWest Division and California State Universities Five DOD cleanups in California and Guam have been completed in the past year and four clean-ups with CSU Channel Islands


CSU Channel Islands / Environmental Protection Agency:
Combining Service Learning with Senior Capstone Research to Map and Assess Marine Debris in Ventura County

Microplastics

Kamilo Point, Big Island of Hawaii

What is driving our focus on the impacts of plastic on the marine environment?

Plastic bottle found at Kamilo Point, Hawaii. Notice the bite marks from birds and fish on the bottle

Ingested marine plastic presents both physical and toxicological threats to wildlife

Credit: John Cancalosi, Nature

Credit: Chris Jordan

Overall Strategy for CERCLA (Superfund) Division Role in Marine Debris:

EPA R9 views plastic marine debris as a *new media of concern* (a floating sediment) capable of harboring and transporting CERCLA hazardous substances

EPA Region 9's first fish tissue study with our colleagues:

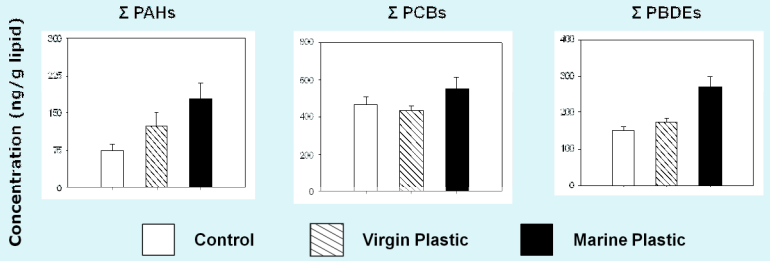
Location of Collection of North Pacific Myctophids
(fish collected by Dr. Margy Gassel, Cal OEHHA, during Project Kaisei 2009 expedition)

Myctophid Study Results from the North Pacific:

- All fish, independent of location and species, demonstrated presence of one or more plastic chemicals (BPA, AP, and/or PBDE) in their tissue.
- Based upon composite samples, significant correlations exist between PCBs and other contaminants.
- Statistical analyses show that exposure from plastic particle ingestion is evident in the fish.

Our second fish study collaboration: Medaka lab study UC Davis/SDSU

- Fish fed contaminated plastic diet show:
  - Clear manifestation of endocrine disruption which can be traced to measurable body burden impacts from contamination
  - Liver histopathology impacts at the cellular level from contaminated plastic



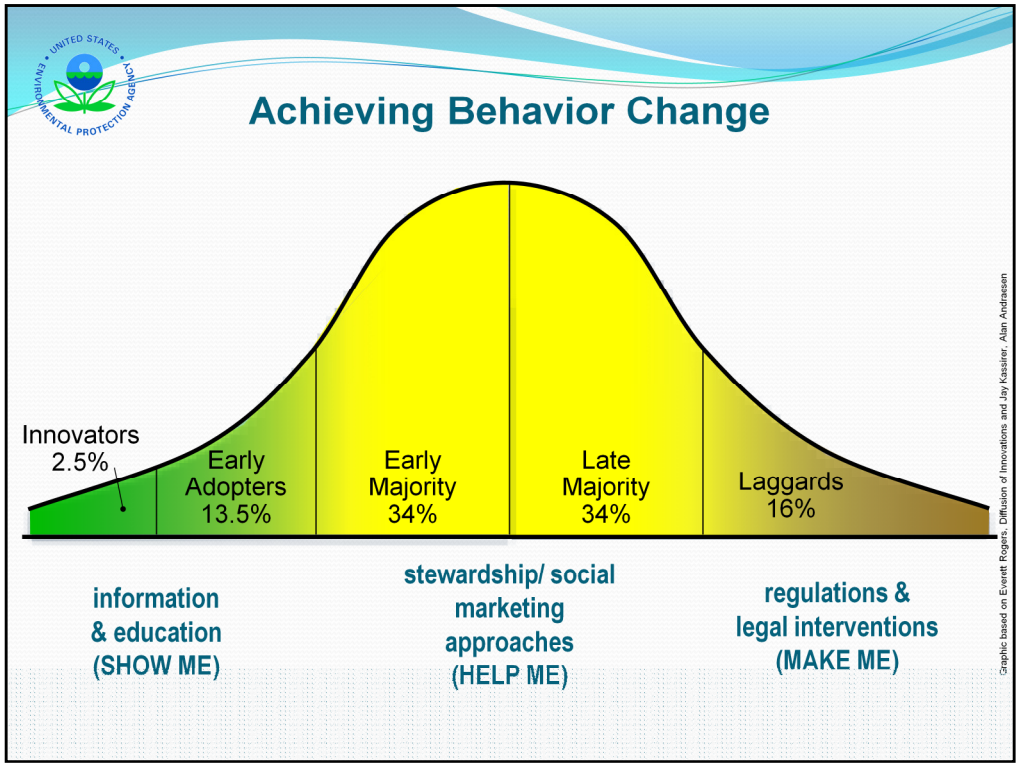
Concentrations of contaminants in Medaka tissue after 2 month dietary exposure

Study conceived, conducted, analyzed and interpreted by Dr. Chelsea Rochman and Dr. Swee Teh, UC Davis

Initial Conclusions Based on the North Pacific Study, Medaka Lab Study, and South Atlantic Study

- There is a synergistic effect between two common ocean pollutants: persistent, bioaccumulative, toxic chemicals and plastic debris. Plastic serves to concentrate and transfer toxic chemicals from the ocean into the marine food web and potentially to human diets.

- The fact that plastic and toxics interact in this way, essentially forming a "toxic cocktail", increases the risk of adverse effects to humans and wildlife.


Achieving Behavior Change
Innovators
2.5%
Early
Adopters
13.5%
Early
Majority
34%
Late
Majority
34%
Laggards
16%
information
& education
(SHOW ME)
stewardship/ social
marketing
approaches
(HELP ME)
regulations &
legal interventions
(MAKE ME)
Graphic based on Everett Rogers, Diffusion of Innovations and Jay Kassirer, Alan Andreasen

Answers?